THE MAKING OF URBAN SPACES FOR THE KNOWLEDGE ECONOMY: GLOBAL PRACTICES

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INTRODUCTION

The 21st Century is being identified as the 'Century of Cities' and only few aspects of today's world may characterize better the dawn of the new millennium than transformation of cities and regions into knowledge societies, and their economies into knowledge economies (Landry, 2000). The 21st Century is also being identified as the 'Century of Knowledge' where knowledge is the driving force of the economic and urban development (Drucker, 1994). Carrillo (2006) combined these two and identified the 21st Century as the 'Century of Knowledge Cities'.

A knowledge city aims at a knowledge-based urban development (KBUD) by encouraging the continuous creation, sharing, evaluation, renewal and update of knowledge. The main advantage of a knowledge city is that it functions in such a way that is in favour of its KBUD (Ergazakis et. al., 2006). Some of the major benefits of the KBUD are a strong knowledge economy, quality of life and vibrant cultural life of a city. The emergence of the knowledge economy is not a spatially neutral phenomenon. Some urban regions seem better prepared and equipped than others to benefit from changing economic circumstances.

The central goal of this paper is to shed light on the different KBUD policies and transition path towards a knowledge economy and knowledge city. The paper aims to discover common features of cities in coping with a global competitive environment. Therefore, this paper focuses on successful global knowledge city experiences. The paper examines a number of cases from different urban regions, which are selected for their innovative approaches (and success) to enhance the knowledge economy. These cities' pursuit of excellence in planning successful solutions for their own needs provides an inspiration for urban stakeholders elsewhere. The experiences on how these cities are managing to attract and generate new knowledge industries by providing urban spaces to suit their requirements, and high quality urban spaces to satisfy their knowledge workers are useful for other cities. This paper produces a wealth of inspirational information on cities preparing for the knowledge age from different parts of the world. The case studies include Austin, Helsinki, Melbourne, Barcelona and Singapore. These cases illustrate a wide range of knowledge based urban planning and development approaches.

The paper consists of five main sections. Following the introduction section, the second section discusses the concepts of knowledge economy, knowledge city, and KBUD. The third section introduces five successful global knowledge city practices, and analyses their creative planning approaches and success factors. The fourth section, discusses the lessons learned from these knowledge city case studies. Then

the paper concludes by providing useful generalised recommendations for the transformation of cities into knowledge cities in a knowledge economy.

KNOWLEDGE BASED URBAN DEVELOPMENT

Many cities worldwide face the prospect of major transformation in the 21st Century as the world moves towards a global information order (Castells, 2000). In this new era, already upon us, urban economies are being radically altered by dynamic processes of economic and spatial restructuring (Graham and Marvin, 1996). The result is the creation of 'knowledge cities'.

For the last two centuries social production had been primarily understood and shaped by neo-classical economic thought that recognized only three factors of production: land, labour and capital. Neo-classical economics considered knowledge, education, and intellectual capacity as secondary, if not incidental, parameters of production (Knight, 1995). Human capital was assumed to be either embedded in labour or just one of numerous categories of capital. In the last decades, however, it has become apparent that knowledge in and of itself is sufficiently important to deserve recognition as a fourth factor of production. In the globalizing knowledge-based economy, knowledge and information and the social and technological settings for their production and communication are now seen as keys to development and economic prosperity (Lever, 2002).

The rise of knowledge-based opportunity has, in many cases, been accompanied by a concomitant decline in neoclassic industrial activity (Burton-Jones, 1999; Drucker, 1998). The replacement of physical commodity production by more abstract forms of production (e.g. information, ideas, and knowledge) has however, paradoxically, reinforced the importance of central places (cities) and led to the formation of knowledge cities.

It is mainly in cities that knowledge is produced, marketed and exchanged. Therefore, knowledge cities aim for a KBUD that assists decision-makers in making their cities compatible with the knowledge economy and thus able to successfully compete with other cities. Knowledge cities provide their citizens with enabling conditions that foster knowledge creation, knowledge exchange and innovation (Ergazakis et al., 2004). They also encourage the continuous creation, sharing, evaluation, renewal and update of knowledge.

To compete nationally and internationally cities need knowledge infrastructures (e.g. universities, research and development institutes); a concentration of well-educated people; technological, mainly electronic, infrastructure; and connections to the global economy (e.g. international companies and finance institutions for trade and investment). Moreover, knowledge cities must not only possess the people and things necessary for the production of knowledge but, as importantly, function as breeding grounds for talent and innovation (Winden and Berg, 2004).

The economy of a knowledge city creates high value-added products using research, technology, and brainpower. In the knowledge city, the private and the public sectors value knowledge, spend money on supporting its discovery and dissemination and,

ultimately, harness it to create goods and services (Carrillo, 2006). Although many city initiatives call themselves knowledge cities, currently, there are only a few cities around the world (e.g., Barcelona, Delft, Dublin, Montreal, Munich, and Stockholm) that have earned that label. Many other cities aspire to the status of knowledge city through urban development programs that target KBUD (Ergazakis et al., 2004). Examples include Copenhagen, Dubai, Manchester, Monterrey, Singapore, and Shanghai.

In the knowledge era, sustainable economic growth and development is highly associated with knowledge economies (Metcalfe and Ramlogan, 2005). The term knowledge economy was first introduced by the OECD in 1996. A knowledge economy creates, distributes, and uses knowledge to generate value and gives rise to "a network society, where the opportunity and capability to access and join knowledge and learning intensive relations determines the socio-economic position of individuals and firms" (Clarke, 2001:189). Rapid advances in information and communication technologies (ICTs) during the last two decades established the infrastructure that enables the knowledge economy to scale up. The main novelty of the knowledge economy consisted of the need to manage an intangible asset that, in contrast to material resources, does not depreciate through use but rather becomes more valuable the more it is used (Laszlo and Laszlo, 2006).

According to Buckley and Mini (2000) a city's knowledge economy is the economic wealth and well being that results from the effective investment in people and ideas that create an environment where information, creativity, goods and services are produced and exchanged, drawing on best practices. It requires a skilled labour force, up-to-date knowledge, effective use of technology (primarily ICTs), and broad city resources that foster a productive urban economy. In this process, communication, good governance and partnerships are developed with all major stakeholders.

Emerging from analysis of the knowledge economy has been recognition by some of the role of creativity as the force behind knowledge (Corey and Wilson, 2006). Landry (2000), Florida (2005) and Henderson (2005) directed planners and urban administrators to think about the environmental and cultural assets of the cities and communities as economic resources. Corey and Wilson (2006) underlined the important role of ICTs in developing a knowledge economy and KBUD.

KBUD is a powerful strategy for economic growth and the post-industrial development of cities and nations to participate in the knowledge economy. It is a strategic management approach, applicable to purposeful human organizations in general (Carillo, 2002). KBUD has two purposes: The first one is, it is an urban development strategy that codifies technical knowledge for the innovation of products and services, market knowledge for understanding changes in consumer choices and tastes, financial knowledge to measure the inputs and outputs of production and development processes, and human knowledge in the form of skills and creativity, within an economic model (Lever, 2002). The later one is that, it indicates the intention to increase the skills and knowledge of people/residents as a means for individual and social development (Gonzalez et. al., 2005). KBUD policies includes: developing and adopting the state of art ICTs, distributing instrumental capital, developing human capital, and developing capital systems (Carrillo, 2002).

To date, the structuring of most of the knowledge cities (or regions) has proceeded organically: in essence, as a dependent and derivative effect of global market forces. Urban and regional planning has responded slowly, and sometimes not at all, to the challenges and the opportunities of the knowledge city. Therefore, in recent years urban planning has consolidated its interest in the paradigm of post-modern social production under the rubric of KBUD (Carrillo, 2004). Planning sees KBUD as a new form of urban development for the 21st Century that could, potentially, bring both economic prosperity and sustainable socio-spatial order to the contemporary city. The goal of KBUD is a knowledge city purposefully designed to encourage the production and circulation of abstract work (Cheng et al., 2004). KBUD can also be regarded as a tool or an approach to nourish the transformation and renewal of cities into knowledge cities and their economies into knowledge economy (Yigitcanlar, 2005).

The social benefits of KBUD extend beyond aggregate economic growth. On the one hand is the possibility of a particularly resilient form of urban development secured in a network of connections anchored at local, national, and global coordinates. On the other hand, quality of place and life, defined not only by the level of public service (e.g. health and education) but also by the conservation and development of the cultural, aesthetic and ecological values that give cities their character and attract or repel the creative class of knowledge workers, is a prerequisite for successful KBUD. The promise of KBUD is a secure economy in a human setting: in short, smart growth or sustainable urban (and economic) development.

GLOBAL KNOWLEDGE CITY PRACTICES

The human capital, Austin, Texas, USA

Austin was one of the first US cities to recognise both the emerging economic importance of knowledge work and the possibilities of attracting 'footloose' industry. The city, led by business organisations, having decided to lure these new 'clean' industries to the area, developed a plan to attract large corporations by touting the relatively low cost of living and the quality of Austin university graduates – especially in the discipline of engineering. Founded in 1883 the University of Texas at Austin has long been considered as an elite public university, comparable in quality to private Ivy League institutions such as Yale and Harvard.

Austin's dual promise of cost savings and high quality (mental) labour proved effective and by the late 1950s the city boasted a fledgling electronics production sector with instrument maker TRACOR (supplying, mainly, the military) one of the more notable corporate names. The following decade saw the beginnings of the production of personal computing commodities. Austin was an early beneficiary of this new market attracting Texas Instruments (a leader in the construction of electronic hand calculators) to its growing knowledge industry base. Despite building success that, in the 1970s, saw Unisys, Westinghouse and Compaq establish a presence in Austin, the city did not rest on its laurels. In 1980 the city's local government, again with important contributions form the Austin Chamber of Commerce and representatives from wider the business community, drew up the 'Austin 2010 Plan'. The plan marked an evolution in KBUD policy.

The traditional focus on the production process continued. At the same time the 'Austin 2010 Plan' committed to the systematic development of research capabilities in technology and computer science at the University of Texas. The 2010 Plan also launched a tradition of local government working hand-in-hand with leading figures in the regional private sector to create an exemplary entrepreneurial climate and an open, flexible interface between government and business. Communication, between different sectors of society and around questions of the production innovation, was a central feature of Austin's creative environment. It was given effect via a local government sanctioned network of companies and individuals.

The 'Austin 2010 Plan', in marked innovation for 1980, committed the city to (re)develop its urban and cultural life in ways that would attract and retain knowledge workers. Economic development policy, in short, widened its purview and started to explicitly consider the living conditions of workers. In one of its most prominent initiatives the city started to self-consciously promote its legacy of music. In 1991 Austin capped this aspect of its lifestyle promotion with the adoption of an official city slogan: 'Live Music Capital of the World'. The slogan found ready acceptance in the US thanks largely to the television series 'Austin City Limits'. In its early recognition of the importance for 'the creative class' of lifestyle choice(s) Austin was again in the vanguard of knowledge work(er) development. This dual-focus urban development policy helped launch high-skill, value-adding urban development in Austin on a path of sustained growth (Baum et al., 2006).

Today, Austin with its high level of skill in-migration, an enviable patent-grant rate, a vibrant music-centred cultural environment, is home to the headquarters of many leading ICT, biotech and pharmaceutical companies. Austin, committed to continual KBUD, is currently attempting to leverage these strengths in ICT and biotech, and its tradition of research excellence, into new sectoral growth in wireless, advanced auto-manufacturing and clean energy technologies (Smart State Council, 2006). Relatively unknown in 1980 when it drafted its Austin 2010 Plan, the city is now in the top tier of global indices of knowledge development, ranking second on Florida's (2002) creativity index and sixth on his innovation index. Overall Austin ranks third in the 2002 World Knowledge Competitiveness Index – a study 300 cities around the world (Michaud and Tcheremenska, 2003).

With almost half a century of experience in attracting and retaining creative industries and knowledge workers, Austin is home to more than 2,200 creative industry firms, employing approximately 160,000 knowledge workers (Powers, 2006). Most of these firms cluster around downtown Austin.

The strong growth of knowledge-based production in the last decade has intensified competition for highly educated knowledge workers. The seemingly ever-tightening market for mental labour has tended to polarised urban regions. Those areas with a concentration of such workers prosper at above average rates, while those that do not are increasingly losing ground not only relatively but absolutely (King and Keating, 2005). Thus, the value of a well-educated knowledge workforce (engineers, scientists, PhDs – in proximity to major universities, with world class faculty and large R&D budgets) while long recognised, has, with the passage of time, grown, rather than diminished. In Austin this is reflected in the city's continued support for its universities and of the research milieu that has formed around them. In Austin

metropolitan area there are seven universities and colleges, offering courses in such scientific fields as: agricultural science; biological/life science; computer and information science; engineering; physics; and health science. In the year 2000 Austin was the first ranked US city in regional student concentration – full-time students per 1,000 residents (Pennsylvania Economy League, 2000). The president and CEO of Samsung Semiconductor, Dr Hee Park confirms "the number of highly trained knowledge workers of the region" was a decisive influence in Samsung's decision to set up shop in Austin.

In addition to its continuing attention to the traditional dimensions of knowledge-industry development, Austin has embraced the new concept of creating a particular 'people climate' to attract knowledge workers. In summary Austin has pursued quality of place in the provision of:

- Stylish built environment(s)
- Extensive city parklands
- Conservation of natural surroundings
- A rich variety of cultural institutions
- Quality affordable housing
- Quality hospitals
- Quality schools and universities
- An efficient traffic system

In tandem with an attractive physical environment Austin also promotes human activity. On the bedrock of a pleasant and dependable climate the city offers:

- A wide range of outdoor recreation opportunities
- A diverse range of ethnic and cultural settings
- A vibrant nightlife
- A thriving live music scene

Insofar as Austin stands out as a city of music, alive to the possibilities of creativity and innovation, its policies in the area bear closer inspection. Again the city has not rested content with past achievements but has set in place structures to support:

- Novel performance genres with strong new-technology content
- Strong ties between artists, the business community and government to encourage and reward musical innovation and avant-garde technique (Michaud and Tcheremenska, 2003)

Besides quality of place and life Austin has also developed a culture of social tolerance that is attractive to creative people with ideas (and skills) that diverge from the norm. The drive for diversity and tolerance is, however, not an ethical issue. Rather, it is argued, the gathering together of difference – the concentration of diversity – is an efficient mechanism for hot-housing innovation.

A series of appellations trace the success of Austin. In the 1990s the city was hailed as a 'technopolis'; at the turn of the millennium it was known as a 'knowledge city' with more than one-third (36.4%) of its workforce employed in knowledge-based industry

(Florida, 2002). More recently, in recognition of quality of lifestyle it has created for its residents, Austin was accorded the title 'the human capital', (Powers, 2006). Finally, in 2006 the city was found to be the most attractive US location for creative industry investment (King, 2006). In reflecting on Austin success Florida (2005) commends the city's focus on the 'three Ts': 'technology', 'talent' and 'tolerance'.

The telecommunication capital, Helsinki, Finland

In Europe, Finland was one of the first countries to develop explicit knowledge economy strategies. The economic crises in the early 1980s and, especially, 1990s were major incentives for knowledge strategy formation. The early national involvement with the knowledge economy activities makes Finland a frontrunner compared with other European countries where specific national knowledge economy policies have been formulated only recently (Van den Berg et al., 2004).

Helsinki has been a success in many recent international city comparisons concerning competitiveness, research, knowledge and quality of life. The success of Helsinki mainly originated from the strategic actions of many public actors during the last decade and the high quality of education and the good relations between research and business. In mid 1990s city administration understood the fatal importance of visionary and strategic thinking as the driving force of KBUD. The Finnish Local Government Act was amended in this direction in 1995. At the regional level strategic thinking was developed by the Helsinki Club in 1996. The Club prepared strategies for the region and published a report entitled 'Success strategies and partnership projects in the Helsinki Region" in 1997. On the basis of this report many partnership projects have been realised. In 2002, Helsinki Club II was convened and in 2003 formulated a common vision and strategies for the region on; strategic emphasis; internationalisation; culture; and knowledge base and economy (ISOCARP, 2005).

The Helsinki region has managed to keep up its competitive edge, mainly because of telecommunications and mobile telephone industry (i.e. Nokia). Results of implemented strategies were employment growth both in research and development and in creative sectors. However OECD Report on Helsinki (2002) warned Helsinki's administrators that long-term regional competitiveness requires a more focused strategy of diversification, i.e. developing ICT activities beyond the current (mobile phone technology) cluster scope.

In 2004, the Helsinki Metropolitan Area Advisory Board was established with the participation of every city council in the region. The Board approved the 'Common Vision and Strategy for Helsinki Area'. The vision was that: The Helsinki Metropolitan Area is a dynamic world-class centre for business and innovation. Its high quality services arts and science, creativity and adaptability promote the prosperity of its citizens and bring benefits to all of Finland. The Metropolitan Area is being developed as a unified region close to nature where it is good to live, learn, work and do business.

The strategic goals comprise: joint measures to develop welfare and services; improving competitiveness; and developing the urban structure and housing. Strategies to achieve strategic goals include: joint strategy for welfare services and developing service providers; steering joint service organisations; innovation strategy;

regional business marketing; availability of skilled labour and immigration policy; joint land-use development strategy; efficient transport system; and accountability in housing policies. Shared principles supporting these strategies are: international attractiveness; balanced economy; safety; good governance; inclusiveness; sustainable development; and multiculturalism.

Rapid progress is crucial in a knowledge economy for being able to compete with other city and regions. Therefore the common strategy was prepared and approved rapidly before the municipal elections in late 2004. Newly elected city councils started their four-year period at the beginning of 2005. They allocated a handsome portion of their budget for KBUD, put approved strategies into action, and committed themselves to the work of Advisory Board. In 2005 cities started to develop a planning system that functions better regionally within a basic system of independent municipalities (ISOCARP, 2005).

The aforementioned strategies resulted in an outstanding broad knowledge base of Helsinki. Today Helsinki has (van den Berg et al., 2004):

- A very high level educated population (knowledge workers)
- A high urban quality of life and place (clean and safe)
- Quite a good accessibility (a significant international airport and plans to build several high-speed train links)
- Relatively large investments in arts and culture
- A relatively high social equity
- Become 'the telecommunication capital' of Europe

The art and culture capital, Melbourne, Australia

During the 20th Century Australian cities were shaped mainly by manufacturing activities. According to Brain (1999) in the new millennium Australia's urban processes are now being shaped by the rise of 21st Century occupations (knowledge work). As a result of the spatial urban change in the city these jobs are concentrated in Melbourne's core. Melbourne City administration is well aware of these urban processes and municipal strategies are already developed and applied for the KBUD of the city.

One of the strategy tools for the KBUD in Melbourne is the city plan. The 2010 Melbourne City Plan aims to shape the future of the city as a prosperous, innovative, culturally vital, attractive, people focused, and sustainable city (Shaw, 2003). The objectives of the plan reveal hints about how city's future is planned as a knowledge city. These objectives are (MCC, 2003: 34):

- Develop the city as a gateway for biotechnology in Australia and the Asia-Pacific region
- Redress the skill shortage in the ICT sector and build the city's reputation as the ICT capital of Australia
- Attract key strategic knowledge industry businesses to move to the city and support and facilitate innovative start-up businesses
- Promote growth in the city's tertiary education services

- Develop and promote the city as a place that understands, respects and operates successfully with other business cultures
- Develop and promote the city's diverse and highly skilled workforce regionally, nationally and globally to attract global projects
- Enhance and promote the city's liveability and lifestyle options, including its affordable, high quality housing and educational centres and its rich and diverse culture, as some of the particular benefits of conducting business in the city

Another strategy tool, the metropolitan strategy plan for Melbourne 'Melbourne 2030' builds on the similar visions for the city by focusing on nine key directions, which are: a more compact city, better management of metropolitan growth, networks with the regional cities, a more prosperous city, a great place to be, a fairer city, a greener city, better transport links, and better planning decisions and careful management (Victorian Government, 2002). Melbourne 2030 provides for a strong and innovative economy, based on the view that all sectors of the economy are critical to economic prosperity. Economic clusters play a critical role in the success of KBUD of the city (DoSE, 2003).

Melbourne 2030 reads that "[o]pportunities will be protected for internationally competitive industry clusters seeking large landholdings, and for major logistics industries that need ready access to road and rail networks, airports and seaports" (p:37). This plan also expands logistics and communications infrastructure, including broadband telecommunications services, to underpin development of the innovation economy which is vital to Melbourne's success (Victorian Government, 2002).

In Central Melbourne, the Central Activities District and Docklands are planned to remain a key location for high-order commercial and knowledge intensive development, and entertainment core of the metropolitan area. Continued housing development in Central Melbourne will take advantage of this area's unmatched accessibility to jobs, facilities, recreational and cultural opportunities, adding to the after-hours vibrancy of the inner areas (Victorian Government, 2002).

The traces of Melbourne's success in KBUD are not only evident in these plans. The policies of designing Melbourne as a knowledge city date back to early 1990. Social Justice Coalition's (1991) report on Melbourne's Docklands reveals that Melbourne had a vision of knowledge precincts and the development of these precincts were seen to provide an effective solution to economic problems.

Similarly the Department of Planning and Development (DoPD, 1994) saw the prosperity increasingly depending on the ability of Melbourne to compete in the global knowledge economy. Melbourne metropolitan strategy acknowledged that the performance of Victoria is depending to a large extent on Melbourne's global economic competitiveness and also its ability to operate efficiently as an urban system focused on knowledge creation.

The state and city administrations' support for the communities in keeping up with the knowledge economy and shaping their future is among the key aspects of Melbourne success. The Department of Victorian Communities is committed to working with and across all levels of government, community and business to provide the support and

resources communities need to shape their own future. Some of the significant community strengthening achievements include (DoVC, 2004: 25):

- Local government partnership
- Skilled training for young people program
- Youth employment scheme
- Community jobs program
- Public library assistance
- Local government democratic reform act

To boost sustainable business and trade in Melbourne Federal, State and Local Governments have a number of business development and support funds and programs available for small and medium size and international companies (MCC, 2003). Melbourne has one of the largest concentrations of advanced industrial and scientific research in the Asia-Pacific region (Victoria Government, 2004). The depth of research available is evolving into clusters of cutting-edge expertise not only in academia, but in sectors as diverse as nanotechnology, biotechnology, automotive, aeronautics, financial services and design. There are eight universities operating in Melbourne. They deliver highly relevant and accessible higher education courses and also conduct collaborative research with multinational companies such as Toyota, NEC, Ford, Glaxo Smith Klein, GE Money, IBM, Hawker de Havilland.

Melbourne's success is not only limited to bringing all business, education, research and development clusters together, other clusters (i.e. tourism, sports, art and culture) have also great contributions to its transition into a knowledge city. In 2004 everyday on average a total of 83,000 people visited Melbourne city, which equates to over 30 million visitors to the city annually (City of Melbourne, 2005). Cultural and international sportive activities are among the major factors of Melbourne's tourism attraction. While having a large and vibrant sports life, Melbourne is perhaps best known as 'the art and culture capital' of Australia as it is the home of a large number of art and cultural activities (Yigitcanlar, 2005).

The culture capital, Barcelona, Spain

At the turn of the new millennium, Barcelona finds itself facing the outbreak of a new scientific and technical revolution entailing great political, economic and social challenges. The appearance of a new wave of technological innovations and acceleration in the economy's internationalisation process make traditional forms of organisation in the city obsolete. Faced with the globally competitive environment of the knowledge economy, Barcelona has undertaken a profound technological and cultural regeneration in order to position itself among the major metropolises of the global knowledge society.

In 1999, Barcelona City Council developed a strategic plan for the development of the city with an aim of turning Barcelona into a 'city of knowledge'. This plan emphasised the necessity of the cultural sector to become the motor of a new transformation of the metropolis on the threshold of the 21st Century. 1.6 million residents and more than 200 public institutions were volunteered for the development and implementation of the knowledge city strategy. Private sector's initiatives and

actions – mainly in the development of infrastructures and knowledge businesses – played an important role in the success of the whole process.

Today Barcelona is one of the most successful knowledge cities and marked its name as the 'culture capital' of Europe. Among the various initiatives shaping this vision for a culture of excellence in Barcelona, the 22@Barcelona project stands out on account of its ambitious scope and innovative conceptualisation. 22@Barcelona is leading the transformation of 200 hectare of industrial land in the city centre into a privileged environment for creation, transfer and attraction of knowledge (ISOCARP, 2005).

The features that have characterised the 22@Barcelona project and that constitute what for many has been considered the 'Barcelona model' can be briefly summarised in nine essential points (Garcia-Ramon and Albet, 2000):

- The basic role of public spaces (streets, squares, services, infrastructure, facilities, etc.) as characteristic elements qualifying urban changes. These spaces are used to encourage changes in private spaces, and generate identity and social and cultural integration.
- Full leadership of the local public initiative (municipal administration) for the design and management of urban transformation projects, even in those investments that were mainly of private origin.
- Strict compliance with the existing Urban Master Plan and with pre-established town planning regulations; an attempt to maintain coherence, credibility and legitimacy of the transformations, based on designs and previous agreements and not on proposals that could appear temporary or opportunistic.
- Keeping a global vision of the city despite the exceptional aspect of some of the projects and events (such as the Olympic Games).
- Introduction of a complexity of functions in land uses in the newly built areas, in order to avoid marginal social zones or other with social functional specialization.
- Urban renewal and rehabilitation avoiding gentrification and aiming to maintain social coherence in the affected neighbourhoods.
- Dignifying the peripheral areas.
- Citizens' implication in the project of urban transformation. The 'volunteer' role. The mayor's charisma. Unconditional support by public administrations, financial institutions and socio-economic entities.
- Positioning of Barcelona within the world's context and especially among large cities by strategic urban marketing promotion based on creating and encouraging city lobbies.

The 22@Barcelona Plan can be seen as an excellent example of a 'good practice' of KBUD and urban policy implementation, combining urban planning (urban physical transformation) and urban discourse (the need for a 'city of knowledge'). The ideas proposed in the 22@Barcelona Plan are not innovative. However what is really new and important is that those ideas are formulated in a wider scale (Barcelona in the knowledge economy and society); there is a big implementation possibility; and are presented under a new and exclusive brand of '22@'. At a conceptual level, this is essential because the existence of a label/image (that recall the passage from industrial

22a to informational 22@), allows to generate an effective marketing of the idea and the project (both internationally and locally) and create a powerful coalition between professionals, technicians, land promoters, neighbourhood associations, councillors of the municipality. Besides that, the strict guidance of the plan brings confidence and certainty about good will, public leadership of the project and desire for a social consensus (Clua and Albet, 2007).

The knowledge capital, One-north, Singapore

Singapore launched its biggest knowledge precinct (and community) development 'one-north' under the city's new brand of 'constant change' in late 2001. The proposed 20 year 200 hectare development is a three stage government initiative to create, in its own words "an idea what we are and what we can be – with space to live our lives in harmony, with energy, time for thought and time for being – to realise the potential of what we do and can achieve in our work and play, in what we will learn and how we live" (one-north website: www.one-north.com). In Singapore one-north is seen as being at the cutting edge of KBUD – an initiative that will propel the city state into the knowledge age and establish it as a regional, if not global, centre of research and development (Lim, 2000; Tan, 2001; Koh et al., 2005).

The production and consumption spaces of one-north are to be organised around three poles. They are:

- Biopolis – a concentration of biomedical research and production in high rise structures embedded in a surround of housing,
- Fusionpolis – a centre for the development of ICT, in close proximity to the media concentration Infopolis and conserved heritage housing,
- Vista Xchange – a mix of office, retail, hotel and entertainment development proximate to heritage housing neighbourhoods.

The land-use plan for one-north shows a weave of different land use reflecting the essential one-north concept of the total knowledge community. When one-north is complete it will be a community of work and of recreation – of production and reproduction – of market and affinity. The one-north planners have coined a neologism to express this ambition: DoBe – doing and being. Fundamental to the realisation of DoBe is the creation of integrated residential – leisure/cultural/service – and work communities. Several residential localities in the weave of one-north have been designated as 'creative bohemia' or 'little bohemia' and are to be redeveloped with the specific goal of making physical, organisation and legal space for entrepreneurial activity. On the ground this goal is reflected in a generous designation of 'mixed land use' zones. In these areas knowledge workers will live (in a variety of housing types), work, shop and recreate. The one-north vision of these creative bohemians is:

> Youthful and dynamic, today's technology leaders live near their work and relax when it suits them. One-north will be a new community for this new generation: a place where homes, offices, parks, playgrounds and commerce are mixed into a vibrant social melting pot. Somewhere you can walk to work, see a friend at

> lunchtime and share a meal. A fun place that is always pulsating, never dull and never short of ideas (one-north web site).

Clearly, the concept and design of one-north as a creative/knowledge precinct has been influenced by Florida's understanding of the importance of attracting creative talent with, and retaining it in, a total knowledge environment to become 'the knowledge capital' of South-east Asia. In the planning of the precinct it has been stressed that over and above key industrial infrastructure 'a vibrant cultural scene, such as pubs, clubs and coffee houses is… crucial for facilitating networking among artists, designers, entrepreneurs, scientists, and venture capitalists, hence enhancing the milieu of innovation' (Wong and Bunnell, 2006). This creative milieu is seen as vital for the ongoing success of the precinct insofar as it retains local talent, trains new talent and attracts and retains migrant talent (Baum et al., 2006).

The social and physical engineering of this mixed use knowledge milieu in one-north targets eight interrelated areas – living, connectivity, growing around centres of excellence, transport, housing, education, conservation and ICT. Each sphere is defined by particular parameters of form and function but in all one-north strives to create an ambiance of technological sophistication and contemporary style. Taken together the eight spheres have been planned to create a futurist, compact, mixed use, pedestrian-centric urban form which will ideally foster the kinds of face-to-face interactions important for sustaining the innovation ecology of the knowledge economy (Barth, 2003).

One-north is at the start of its development. It is as much plan as actual knowledge precinct. The concept of one-north is as notable, therefore, as the actual details of its development. It shows, in the broadest sweeps, how a very successful South East Asian city state intends to compete in the global knowledge economy. It takes from tradition by having a long term plan. One-north is committed 20 years of development. In that time it will focus on three apparently separate industries that are, however, on closer inspection evermore inter-related. Certainly ICT is linked to both bio-science and media production. The total one-north environment, or at least the plans for it, suggests a futuristic knowledge village. On an island where development is pinched for space, one-north plans to wrap through the built environment broad ribbons of green space – of 'nature'. The development however will not be pastoral as the intensity of the built form surround ranges from tower blocks, through medium density housing to (relatively) low density detached housing. Through all the spaces – be they of work, of play, of home, of recreation, of retail – one-north plans for one constant: mix. For one-north a mix of experience, of stimulation, of activity is vital both for the production of (new) knowledge and the satisfaction of the desire of knowledge workers (Baum et al., 2006).

LESSONS LEARNED

The literature on KBUD and knowledge cities suggests that the following factors are decisive in the development and growth of knowledge cities (Carrillo, 2006; Landry, 2006; Yigitcanlar et. al., 2007):

- Quality university(s) – to train workers and to research not only new products but new solutions to old problems.
- Local, state and federal government commitment – belief in that public policy can be effective allowing, importantly, continuity of policy.
- Large private companies – as representative of success, as patron/funder of university and private sector research, as incubator of talent that will go on to create new companies, as major source of employment.
- Small private companies – to diversify and broaden economic base, as opportunity for venture capital investment, as source of employment.
- Public enthusiasm – at state and local level providing vision, communication and the building of trust and consensus among broad reaches of stakeholders.
- Quality of life and place – creation of a diverse and stimulating living environment for knowledge-worker households.

The case studies acknowledge that each city is unique and has to build on its existing strengths and weaknesses but at the same time they can learn from each other and adopt similar development frameworks. Arising out of the case studies, the following lessons for urban areas setting out on a KBUD path may be inferred:

- Intervention works – sustained public authority intervention to build KBUD is necessary, requiring both long-term strategic planning and resources to give effect to policy decisions.
- Private sector leadership – the involvement of the private sector is necessary to ensure the development of commercially attractive knowledge production.
- Dynamism needed – knowledge production and knowledge workers are in constant flux, always in search of the new. Successful policy should match this dynamism. The examples teach public authorities not to rest on past achievements, however successful, but to look forward to the next challenge.
- Industry focus – the success was built not by spreading risk over a range of sectors but by focussing on one industry (e.g. electronics) … and then the next new one (e.g. ICT) … and then the next (e.g. biomedicine) … and the next … and the next.
- Entrepreneurial spirit – positive business climate.
- Partnership – public, private and academic cooperation, triple helix model.
- No such thing as too much research – new knowledge is the lifeblood of the knowledge city. Policy and (targeted) financial support for universities and private research consortiums.
- Worker training – excellent education and training facilities, nurturing potential knowledge workers.
- Quality of place and life – culturally active, vibrant, and safe living environments.
- Affordability – low cost of living and taxes, and incentive opportunities.
- Monitoring future trends and stressors – being aware of constant global competition.

CONCLUSION

Knowledge cities are the first new urban formation tailored for the needs of a knowledge economy where ideas rule and there are infinite recipes for innovation and wealth creation. Their feature growth is based on the generation of value using common assets with the purpose of achieving sustainability. The advantages of a knowledge city at global, national and local scales cannot be ignored by the city authorities, policy-makers, private sector investors, and social organizations.

Knowledge cities are complex entities, and attempts to transform cities into knowledge cities will likely result in failure unless they are guided by sound strategic visions. These strategic visions should incorporate policies for attracting and retaining knowledge workers and industries and also empowering citizens as knowledge creators and innovators. The top-tier knowledge cities specialize in a few sectors only, but set ambitious goals for each, and they also develop their knowledge-based policies carefully.

The common strategies for building successful knowledge cities include:

- Political and societal will,
- Strategic vision and (dynamic log-term) development plan,
- Setting-up of agencies to promote KBUD,
- Strong financial support, partnership and strategic investments,
- International and multi-cultural character of the city,
- Creation of urban innovativeness engines,
- Research excellence – universities, R&D institutions,
- Metropolitan web-portal – e-government, e-democracy,
- Value creation to citizens – skill development, employment, social outcomes,
- Quality of place, life and affordable housing,
- Low-cost access to advanced communication networks.

Implementation of the abovementioned strategies and policies for knowledge cities and KBUD requires a broad intellectual team with expertise in urban development, urban studies and planning, socio-economic development, models of intellectual capital and knowledge management. It also requires understanding the diverse spatial forms of the knowledge city where a large number of knowledge clusters are particularly important in the promotion of the spill-over effects found to be vital for long-term economic prosperity.

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